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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/671,802	09/28/2000	Jozef M. Finders	PM 0273961	7922

909 7590 10/22/2003  
PILLSBURY WINTHROP, LLP  
P.O. BOX 10500  
MCLEAN, VA 22102

EXAMINER

CHACKO DAVIS, DABORAH

ART UNIT PAPER NUMBER

1756

DATE MAILED: 10/22/2003

rf

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/671,802

Applicant(s)

FINDERS ET AL.

Examiner

Daborah Chacko-Davis

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 25 July 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) 18-22 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-17 and 23 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

### Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-3, 5-10, 14, and 17, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 5,476, 736 (Tanabe) in view of U. S. Patent No. 5,821,034 (Kim et al).

Tanabe, in col 2, lines 45-57, in col 5, lines 48-60, in col 6, lines 5-39, and in figures 4A, and 4B, discloses a method of projecting an image onto the surface of a photoresist coated wafer using a projection optical system, comprising performing a first exposure using a first mask (reference 4) to form a first optical image on the photoresist film (image partly), performing a second exposure using a second mask (reference 4) to form a second optical image on the photoresist film, wherein the first and second exposures are illuminated by an illumination beam that has a quadrupole or annular distribution (see references 1, 2, and 3 of figures 4A-4B) (claims 1-3). Tanabe, in col 6, lines 11-17, lines 25-29, and lines 46-48, discloses that the mask used for the double exposure process has sub patterns (square shapes, reference 37 of figure 6) and that the first exposure exposes the subpatterns partly to form a first optical image and the second exposure exposes the subpatterns partly to form a second optical image (claim 5). Tanabe, in col 5, lines 16-32, and lines 54-60, and in figures 3, 4A-4B, and 6,

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discloses that the illumination mode (beam) is used to image linear features of the pattern (see figure 6) oriented perpendicular (substantially) to an axis (reference 1 of figures 3, 4A-4B) joining the two poles of the substantially dipolar intensity distribution to form a pattern on the resist film that defines the mask sub-patterns (square shapes)(claims 6-7). Tanabe, in col 5, lines 16-56, and in figure 3, discloses that the illumination system (reference 1) comprise a general relatively weak background intensity (the beam of light is partially darkened and is reduced in light or demagnified) (claim 8). Tanabe, in col 8, lines 50-67, and in col 9, lines 1-21, discloses that between the first exposure and the second exposure the wavelength of the illumination beam is changed resulting in a change in intensity of the illumination beam used in the second exposure process (claim 9). Tanabe, in col 7, lines 1-39, and in col 8, lines 1-19, discloses that the focus of a pattern of the substrate is adjusted (different focal planes employed at each exposure) between the first exposure and the second exposure to ensure optimal focus (very small variation or fluctuation of the obtainable hole size is observed) (claim 14). Tanabe, in col 5, lines 16-67, and in figure 3, discloses a method of exposure using a projection exposure system, comprising providing a photoresist-coated (energy sensitive material) wafer, providing a mask that has a given pattern, and imaging the mask pattern onto the resist coated substrate (claim 17).

The difference between the claims and Tanabe is that Tanabe does not disclose that at least one of the exposures is performed using an illumination mode having a substantially dipole intensity distribution. Tanabe does not disclose that the first and second exposures are in dipolar illumination mode and the axes of the two dipoles

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(reference 1 of figures 11A-11B) are perpendicular to the two illumination beams (mode) (reference 2) (claim 10).

Kim, in the abstract, and in col 2, lines 21-38, discloses that the primary and secondary exposures (first and second exposures) are performed using a dipole illumination aperture (illumination mode with dipole intensity) and that the axes of the two dipoles (spatial frequencies of horizontal and vertical axes) are perpendicular to each other.

Therefore, it would be obvious to a skilled artisan to modify Tanabe by employing the dipole illumination system suggested by Kim because in col 4, lines 4-30, discloses that using a dipole illumination aperture for exposure reduces manufacturing cost, and provides an increase in process margin.

3. Claims 4, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 5,476,736 (Tanabe) in view of in view of U. S. Patent No. 5,821,034 (Kim et al) as applied to claims 1-3, 5-10, 14, and 17 above, and further in view of U. S. Patent No. 5,563,012 (Neisser).

Tanabe in view of Kim is discussed in paragraph no. 2.

Tanabe, in col 2, lines 45-57, in col 5, lines 48-60, in col 6, lines 5-39, and in figures 4A, and 4B, discloses a method of projecting an image onto the surface of a photoresist coated wafer using a projection optical system, comprising performing a first exposure and a second exposure, wherein the first and second exposures are

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illuminated by an off-axis illumination beam (see references 1, 2, and 3 of figures 4A-4B).

The difference between the claims and Tanabe in view of Kim is that Tanabe in view of Kim does not disclose that the masks are exchanged between the first exposure and the second exposure (claim 4). Tanabe does not disclose that the first mask is different from the second mask (claim 23).

Neisser, in col 3, lines 8-48, discloses exchanging the first overlay mask with a second overlay mask between successive exposures, and that the first overlay mask is different from the second overlay mask.

Therefore, it would be obvious to a skilled artisan to modify Tanabe in view of Kim by changing the first mask with a different second mask between the exposures as taught by Neisser because Neisser, in col 1, lines 58-67, discloses that successive exposures of each of the different mask images results in enhanced a) resolution and b) depth of focus.

4. Claims 11-13, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 5,476,736 (Tanabe) in view of in view of U. S. Patent No. 5,821,034 (Kim et al) as applied to claims 1-3, 5-10, 14, and 17 above, and further in view of U. S. Patent Application Publication No. 2002/0109827 (Nishi).

Tanabe in view of Kim is discussed in paragraph no. 2.

Tanabe, in col 2, lines 45-57, in col 5, lines 48-60, in col 6, lines 5-39, and in

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figures 4A, and 4B, discloses a method of projecting an image onto the surface of a photoresist coated wafer using a projection optical system, comprising performing a first exposure and a second exposure, wherein the first and second exposures are illuminated by an off axis illumination beam (see references 1, 2, and 3 of figures 4A-4B)

The difference between the claims and Tanabe in view of Kim is that Tanabe in view of Kim does not disclose that the exposure is performed using polarized electromagnetic radiation (claim 11). Tanabe in view of Kim does not disclose that the polarized radiation is linearly polarized (claim 12). Tanabe in view of Kim does not disclose that the polarized radiation has an electric component oriented substantially perpendicular to an axis joining the two poles of the dipolar intensity distribution (claim 13).

Nishi, in [0009], [0088], [0119], [0120], and [0121], and in figure 5, discloses that the illumination beam is a linearly polarized electromagnetic radiation (UV, 248nm), and that the electric component (ILP) is split by the beam splitter and is propagated perpendicular to the axis joining the two poles of the dipolar intensity distribution.

Therefore, it would be obvious to a skilled artisan to modify Tanabe in view of Kim by employing the method of using linearly polarized electromagnetic radiation and propagating the polarized light through a beam splitter as taught by Nishi because Nishi, in [0123], and in [0138] discloses that employing such a method of illumination mode, the resolution corresponding to a 256M-bit DRAM can be obtained with certainty while



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satisfying the condition regarding the permissible range of the depth of focus regardless of the thickness of the photoresist.

5. Claims 15-16, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 5,476,736 (Tanabe) in view of U. S. Patent No. 5,821,034 (Kim et al) as applied to claims 1-3, 5-10, 14, and 17 above, and further in view of U. S. Patent No. 6,263,099 (Maeda et al).

Tanabe in view of Kim is discussed in paragraph no. 2.

The difference between the claims and Tanabe in view of Kim is that Tanabe in view of Kim does not disclose that at least one of the exposures is performed with an attenuated phase shifted mask (claim 15). Tanabe is does not disclose that the attenuation of the mask is chosen to balance the energy of radiation of the zeroth and first-order diffracted beams as they emerge from the pattern captured by a projecting system used to image the patterns on the substrate (claim 16).

Maeda, in col 21, lines 63-67, in col 22, lines 1-39, discloses that the mask used for the exposure process was of the attenuating type (attenuation filter), and that the attenuation filter was used to balance the intensity of the 0th order diffraction light and the first order diffraction light prior to imaging the pattern grid pattern.

Therefore, it would be obvious to a skilled artisan to modify Tanabe in view of Kim by employing a phase shifting mask as one the masks as suggested by Maeda because Maeda, in col 22, lines 19-39, discloses that balancing the 0<sup>th</sup> order diffraction

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light and first order diffraction light with an attenuating material enables the grid pattern of the object to be detected with high resolution and high contrast.

### ***Response to Arguments***

6. Applicant's arguments, see response, on page 5, lines 24-32, filed on 07/25/2003, with respect to the rejection(s) of claims 1-17, and 23 under 35 USC § 102 (U. S. Patent No. 5,476,736 (Tanabe)) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of claims 1-17, and 23.

A) Applicants argue that Tanabe does not disclose, teach or suggest anywhere using a dipole illumination.

See paragraph nos. 2, and 6. Tanabe teaches the use of an off-axis illumination beam system to expose the resist coated wafer, and Kim, in the abstract, teaches the use of dipole illumination aperture in a projection system to form micropatterns on the semiconductor substrate.

### ***Conclusion***

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daborah Chacko-Davis whose telephone number is (703) 306-5923. If the examiner is unavailable, you may contact her supervisor, Mark F. Huff at (703) 308-2464. FAX communications should be sent to the appropriate FAX

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number; (703) 872-9311 for After Final Responses only or (703) 872-9310 for all other responses. FAXES received after 4:00 P.M. will not be processed until the following business day.

dcd

*md*  
October 7, 2003.



MARK F. HUFF  
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